

**Oracle® Retail Predictive Application Server Batch
Script Architecture**

Implementation Guide

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Preface

The *Oracle Retail Predictive Application Server Batch Script Architecture Implementation Guide* is intended for integrators and implementation staff, as well as the retailer's IT personnel.

Audience

This Implementation Guide is intended for the Predictive Application Server Batch Script Architecture application integrators and implementation staff, as well as the retailer's IT personnel. This guide is also intended for business analysts who are looking for information about processes and interfaces to validate the support for business scenarios within Predictive Application Server Batch Script Architecture and other systems across the enterprise.

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For more information, see the following documents in the Oracle Retail Predictive Application Server Batch Script Architecture Release 16.0 documentation set:

- *Oracle Retail Predictive Application Server Batch Script Architecture Implementation Guide*

Also see the following applications' document sets that include information about BSA:

- Oracle Retail Advanced Inventory Planning
- Oracle Retail Analytic Parameter Calculator for Regular Price Optimization
- Oracle Retail Assortment Planning

- Oracle Retail Category Management Planning and Optimization / Macro Space Optimization
- Oracle Retail Demand Forecasting
- Oracle Retail Item Planning
- Oracle Retail Item Planning Configured for COE
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The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

Introduction

The Oracle Retail Predictive Application Server Batch Script Architecture (RPAS BSA) is designed to provide a robust, enterprise-ready architecture for parallel process control, restart control, log consolidation, and dependency checks. Applications that take advantage of the architecture include:

- Oracle Retail Advanced Inventory Planning
- Oracle Retail Analytic Parameter Calculator for Regular Price Optimization
- Oracle Retail Assortment Planning
- Oracle Retail Category Management Planning and Optimization
- Oracle Retail Demand Forecasting
- Oracle Retail Item Planning
- Oracle Retail Item Planning Configured for COE
- Oracle Retail Macro Space Optimization
- Oracle Retail Merchandise Financial Planning
- Oracle Retail Regular Price Optimization
- Oracle Retail Replenishment Optimization
- Oracle Retail Size Profile Optimization

Functionally, the batch operability is enhanced by making it easier to diagnose and correct problems. Errors and exceptions are isolated (contained) within the applications' domains in which they occur. Processing is designed to easily restart and proceed with execution.

Parallel tasks are managed, logged, and checked for errors, to the same standard as non-parallel tasks.

RPAS BSA provides the following features:

- Error handling and logging architecture and their implementation
- Script parallel process management (logging, error control, and waiting) framework

The RPAS BSA is a common component architecture that is used by many of the Oracle Retail application batch scripts for the reusing of code. The RPAS BSA has a structured approach of execution.

In addition to modularization and complete separation of the generic functionality, additional functionality has been added, including the management of access

credentials for database connections, and SQL query, move and copy-with confirmation, and HTML- and XML-based logging.

Contents of This Guide

This implementation guide addresses the following topics:

- [Chapter 1, "Introduction"](#)— Overview of RPAS BSA and the applications that use RPAS BSA architecture.
- [Chapter 2, "Getting Started"](#)— Explanation of RPAS BSA deployment.
- [Chapter 3, "Batch Architecture Functionality"](#)— Information on RPAS BSA functionality that includes containment and management of shell environment settings, logging, error handling, and parallel control.

Getting Started

Specialized application environment setup is best done by setting up a common script that is sourced by all the specialized application environment scripts. The common script should initialize the specialized environment settings, and then source `bsa_common.sh` to complete the environment setup. Each specialized environment script should normally cache any input parameters (preferably saved to a local, descriptively-named script variable), and then source the common application script.

Availability of the Batch Script Architecture

The Batch Script Architecture components are a standard part of all RPAS installations, and no separate installation process is required in order to make use of BSA. The BSA script files are found inside `$RPAS_HOME/bin` and should already be in the search path once the standard RPAS installation steps have been followed.

Batch Architecture Functionality

The RPAS BSA provides structure and helper functionality for containment and management of shell environment settings, logging, error handling, and parallel control. The following scripts are included:

Script	Description
bsa_common.sh	A convenience script that sources <code>bsa_env.sh</code> , <code>bsa_logger.sh</code> , <code>bsa_verify.sh</code> , and <code>bsa_para.sh</code> for simplified packaging.
bsa_env.sh	Environment settings (paths, and so forth) are optional redefinitions that can be preset in the environment or in a local environment script to specialize for each installation. Also includes routines to programmatically create, verify, and adjust the environment settings.
bsa_logger.sh	Functionality to perform automatic and manual information and error logging.
bsa_para.sh	Functionality to perform parallel process control, error containment, and logging.
bsa_verify.sh	Utility functions to perform verifications of scripts and binary executions.
bsa_cred.sh	Utility functions to manage access credentials (Connect string for Oracle database).
bsa_sql.sh	Utility functions to fetch values from, and runs stored procedures/functions on, the Oracle database.

Logger Functionality Overview

The `bsa_logger.sh` script contains utility API functions to perform basic information and error logging. At its core are the `_log_message` and `_call` APIs that perform explicit information and error logging, and the wrapping of the standard out and standard error streams to the log. The script also enables simultaneous logging to the terminal.

Automatic Functions

In addition to explicit functionality, the `bsa_logger.sh` header script performs the following automatic functions:

Log path setup: A log directory, `$(BSA_LOG_HOME)/<date>`, is created. Logs are created in subdirectories and in a folder hierarchy that exactly parallels the script call stack. Log files are named `<script base name>.log`. Later, a summary log may be implemented. Each log directory name is constructed as follows:

```
<base script name>.<timestamp>.<sequence number>
```

The sequence number is important, as some scripts are called repeatedly in a sequence or in parallel by other scripts. Each distinct call gets its own log. For example, if, on December 27, 2010, the `main.sh` script calls `utility_1.sh` once and `utility_2.sh` two times, the following log directories and files result:

Figure 3–1 Log Path Setup Example

```

.....2010-12-27
.....main.143719.1
.....main.log
.....utility_1.143720.1
.....utility_1.log
.....utility_2.143721.1
.....utility_2.log
.....utility_2.143721.2
.....utility_2.log
    
```

Script Entry Logging

The `_log_message` API is automatically called to log the script entry point to the script's log. Refer to the sections, `Logger Private API` and `Logger Public API` for additional information.

Script Exit Logging

Upon exit, the `_log_message` API is called to log the script exit to the script's log. Both normal and Ctrl+C and other hard exit-induced exits are logged and distinguished, and a descriptive error code number is included in the log message.

Read from the application's environment shell script (for example, `aip_env_rpas.sh`, `environment.sh`), and create, if absent, the environment variable, `BSA_LOG_LEVEL`. This is the minimum level for which log content is generated.

Valid values for this environment variable (`BSA_LOG_LEVEL`) are:

- PROFILE
- DEBUG
- INFORMATION
- WARNING
- ERROR
- NONE

If this variable is not already set by the environment, `bsa_logger.sh` defaults the value to `INFORMATION`.

Read from the application's environment shell script and create, if absent, the environment variable, `BSA_SCREEN_LEVEL`. This is the minimum level for which log content is copied to the terminal.

Valid values for this environment variable (`BSA_SCREEN_LEVEL`) are:

- PROFILE
- DEBUG
- INFORMATION
- WARNING

- ERROR
- NONE

If this variable is not already set by the environment, `bsa_logger.sh` defaults the value to NONE.

Logger Private API

Automatic functionality is implemented by using the private API, as well as the public API. [Table 3-1](#) describes the Logger Private API Scripts.

Table 3-1 *Logger Private API Scripts*

Script	Description
<code>__internal_log_message</code>	Logs the message, complete with the caller's line number
<code>__internal_log_entry</code>	Calls <code>__internal_log_message</code> to log the entry to the script's log
<code>__internal_log_normal_exit</code>	Called implicitly by the firing of the shell EXIT trap; calls <code>__internal_log_message</code> to log the exit code and message to the script's log
<code>__internal_log_forced_exit</code>	Called implicitly by the firing of the shell INT and CLOSE traps; calls <code>__internal_log_message</code> to log the exit code and message to the script's log

Logger Public API

Automatic functionality is implemented by using the private API, as well as the public API. [Table 3-2](#) describes the Logger Public API Scripts and Environment Variables:

Table 3–2 Logger Public API Scripts and Environment Variables

Script	Description
BSA_LOG_LEVEL environment variable	<p>The BSA_LOG_LEVEL environment variable, found in the application's environment script (for example, <code>environment.ksh</code>), can be set to the desired level of logging to the log files. Valid values are:</p> <ul style="list-style-type: none"> ■ PROFILE ■ DEBUG ■ INFORMATION ■ WARNING ■ ERROR ■ NONE <p>If this variable is not already set by the environment, <code>bsa_logger.sh</code> defaults the value to INFORMATION.</p>
BSA_SCREEN_LEVEL environment variable	<p>The BSA_SCREEN_LEVEL environment variable, found in the application's environment script (for example, <code>environment.ksh</code>), can be set to the desired level of logging to the terminal. Valid values are:</p> <ul style="list-style-type: none"> ■ PROFILE ■ DEBUG ■ INFORMATION ■ WARNING ■ ERROR ■ NONE <p>If this variable is not already set by the environment, <code>bsa_logger.sh</code> defaults the value to NONE.</p>
<code>_log_message <level> <message></code>	<p>Implemented as an alias that captures the script line number and calls <code>__internal_log_message</code>. The level can be:</p> <ul style="list-style-type: none"> ■ PROFILE ■ DEBUG ■ INFORMATION ■ WARNING ■ ERROR ■ NONE <p>It writes the time stamp, level, script name, line number, and message to the script's log and/or terminal, depending on the level as compared with the BSA_LOG_LEVEL and BSA_SCREEN_LEVEL. This renders obsolete most uses of <code>echo</code> and <code>print</code> to the log file.</p>
<code>_call <script or binary call with params></code>	<p>Wraps any script or binary call so that the standard error and standard out are redirected to the script's log file. This renders obsolete most uses of <code>></code> and <code>>></code>.</p>

Send Log to Screen

RPAS BSA allows for logging of output to the screen, simultaneous with logging to log files. This is controlled by the environment variable BSA_SCREEN_LEVEL.

Valid values for this environment variable (BSA_SCREEN_LEVEL) are:

- PROFILE
- DEBUG

- INFORMATION
- WARNING
- ERROR
- NONE

If this variable is not already set by the environment, `bsa_logger.sh` defaults the value to `INFORMATION`. Logging to file is still controlled by the existing variable `BSA_LOG_LEVEL`. The two levels for `LOG` and `SCREEN` are independent.

Verification of Successful Completion

The verify functions provide single-line error handling after calling any script or binary. These three API functions ensure the success or report the failure and exit the batch, based on the run of a script, binary, or the identification of an error string in the script's log:

- `_verify_script`
- `_verify_binary`
- `_verify_log`

Verify the Public API

Note: In order for `_verify_script` to work correctly, all the scripts should exit only with predefined exit codes. Under no circumstances should exit be called without a code, nor should any return be called.

Table 3–3 *Verify Script Descriptions*

Script	Description
<code>_verify_script</code>	This is implemented as an alias that captures the script line number and calls <code>__internal_verify_script</code> . This function must be called immediately after the script to be verified. It checks the return value from the script; if nonzero, it posts an error code specific message to the script's log with <code>level=ERROR</code> , and then exits from the script with the same code. This, along with <code>_verify_binary</code> , renders obsolete most processing functions of \$?.
<code>_verify_binary <custom error message></code>	This is implemented as an alias that captures the script line number and calls <code>__internal_verify_binary</code> . This function must be called immediately after the binary to be verified. It checks the return value from the binary; if nonzero, it posts the passed custom error message to the script's log with <code>level=ERROR</code> , and then exits from the script with a standard error code (not the binary exit code). The standard error code is returned so that the calling script can automatically report the error by use of <code>_verify_script</code> . This, along with <code>_verify_script</code> , renders obsolete most processing functions of \$?.

Table 3–3 (Cont.) Verify Script Descriptions

Script	Description
_verify_log	This is implemented as an alias that captures the script line number and calls <code>__internal_verify_log</code> . This function performs grep-based checking of the script's log for an easily configured list of strings, including error, exception, and failure. If a configured string is found, a log entry is generated with <code>level=ERROR</code> , indicating the error found; and then a non-zero exit is performed to immediately halt the script. This renders obsolete most functions in the explicit grepping of log files.

The codes defined for use as script exits are as follows:

- __CODE_SUCCESS
- __CODE_NONZERO_EXIT
- __CODE_FORCED_EXIT
- __CODE_FILE_NOT_FOUND
- __CODE_NONEXISTENT_LOG_FILE
- __CODE_NONEXISTENT_ERROR_FILE
- __CODE_TOO_FEW_ARGS
- __CODE_TOO_MANY_ARGS
- __CODE_UNSPECIFIED_ERROR
- __CODE_GENERAL_SCRIPT_ERROR
- __CODE_UNDEFINED_ERROR_LEVEL
- __CODE_MACE_ERROR_LEVEL
- __CODE_INVALID_PATH
- __CODE_INVALID_DOMAIN_PATH
- __CODE_PARALLEL_ERROR
- __CODE_UNSUPPORTED_FUNCTIONALITY
- __CODE_UNSUPPORTED_DATA_SET_KEY
- __CODE_FIRST_LOG_ERROR
- __CODE_LOGGED_ERROR
- __CODE_LOGGED_EXCEPTION
- __CODE_LOGGED_FATAL
- __CODE_LOGGED_ABORT
- __CODE_LAST_LOG_ERROR

Overview of the Parallelization Functionality

A framework for the parallelization of script and binary calls is introduced to replace the use of the naked ampersand (&), for executing commands in the background, and wait commands. The framework has these three components:

Function	Description
BSA_MAX_PARALLEL environment variable	<p>The <code>BSA_MAX_PARALLEL</code> environment variable, found in the application's environment script (for example, <code>environment.ksh</code>), should hold a positive integer value.</p> <p>This value is interpreted by the <code>para_spawn</code> function as the maximum number of processes that can be started in parallel, from any spawning process.</p> <p>This value is not the maximum total number of running processes, as spawned processes may further spawn more processes.</p> <p>If this variable is not already set by the environment, <code>bsa_env.sh</code> defaults the value to 4.</p>

Function	Description
<code>_para_spawn</code> function	<p>The <code>_para_spawn</code> function is a replacement for invoking a script or binary with a trailing <code>'&'</code> (ampersand). The <code>_para_spawn <command></code> starts <code><command></code> in parallel, as soon as the number of processes spawned by the spawning process falls below <code>BSA_MAX_PARALLEL</code>.</p> <p>Scripts spawned with <code>_para_spawn</code>, log messages just like the non-parallel-called scripts. <code>_para_spawn</code> must be used only in conjunction with <code>_para_wait</code>.</p> <p>For more information, see the section, Para API.</p>
<code>_para_wait</code> function	<p>The <code>_para_wait</code> function is a replacement for the <code>wait</code> command, and it should always be used to wait for processes spawned with <code>_para_spawn</code>. <code>_para_wait</code> handles the detailed reporting of spawned process failures and returns; either <code>__CODE_SUCCESS</code> (0) if all the parallel processes succeed, or <code>__CODE_PARALLEL_ERROR</code> if any spawned process fails. The <code>_para_wait</code> must be used only in conjunction with <code>_para_spawn</code>.</p> <p>For more information, see the section, Para API.</p>

Para API

[Table 3–4](#) describes the Para API functions:

Table 3–4 Para API Functions

Function	Description
<code>_para_spawn <script or binary call with params></code>	<p>This function wraps the calling of a script or binary, in parallel. This renders obsolete the use of standard parallel calling <code>"&"</code> (ampersand). Scripts or binaries called using this function are started only if the number of processes that have already been spawned from the same calling script and still running do not exceed the <code>BSA_MAX_PARALLEL</code> environment variable. If the number of already spawned and still running jobs equals <code>BSA_MAX_PARALLEL</code>, then, this function waits until at least one of the jobs completes, before spawning the requested job. The <code>_para_spawn</code> must be used in conjunction with <code>_para_wait</code>. The <code>_para_spawn</code> should not be called with the <code>_call</code> function, although the use of <code>_call</code> within a script spawned by <code>_para_spawn</code> is acceptable.</p>
<code>_para_wait</code>	<p>This function wraps the <code>wait</code> function, and should be used to wait for jobs spawned using <code>_para_spawn</code>. It returns 0 if all the jobs spawned with <code>_para_spawn</code> return 0, or nonzero (actually, the resolved value of <code>__CODE_PARALLEL_ERROR</code>), otherwise.</p> <p>After executing <code>_para_wait</code>, a script should next call <code>_verify_script</code> in order to determine if any of the parallel processes returned with a non-zero return code.</p>

Tar Command Customization

RPAS BSA includes functionality for uncompressing and unpacking a file that has been packed with UNIX's `tar` and `compress` utilities. The `tar` command used by RPAS BSA is customizable by editing `bsa_env.sh` and replacing `"TAR=tar"` with the name or full path of any alternate version of `tar` required to circumvent standard UNIX `tar` file size limits.

SQL Query Wrapping

The API functions, `_sqlplus` and `_sqlplus_fetch`, are used to simplify the database access through batch scripts. Both functions use the RPAS BSA credential file to obtain the schema access. The credential file application can be sent to the functions. Both functions use `DEFAULT_BSA_SQL_CRED_APP` for credential lookup if an application is not passed.

The `_sqlplus` function can be sent a string of PL/SQL commands, including calls to stored procedures and functions. The function propagates connection errors, syntax errors, unhandled database errors, and handled PL/SQL logic errors. The `_sqlplus` function commits automatically.

The `_sqlplus_fetch` function can be sent a SQL query. It propagates connection errors, syntax errors, and unhandled database errors.

RPAS BSA Setup

Prior to the sourcing of the RPAS BSA common architecture scripts, a batch script or its caller must specialize the RPAS BSA environment settings as necessary (for example, to set `BSA_LOG_HOME` to a local, writable directory). The RPAS BSA architecture is designed to set the environment settings only if they are not preset by the specialized environment. In other words, set up the application environment, and then source the RPAS BSA architecture scripts, which fine tune and default any necessary settings that do not already exist.

Specialized application environment setup is best done by setting up a common script that is sourced by all the specialized application environment scripts. The common script should initialize the specialized environment settings, and then source `bsa_common.sh` to complete the environment setup. Each specialized environment script should normally cache any input parameters (preferably saved to a local, descriptively-named script variable), and then source the common application script.

The following variables in [Table 3–5](#) should be customized. Some of these have been described more extensively in the preceding documentation.

Table 3–5 RPAS BSA Variables

RPAS BSA Variable	Default Value	Description
<code>BSA_ARCHIVE_DIR</code>	<code>\$TMP</code>	The directory that will contain the copies of archive files created with <code>tar</code> and <code>compress</code> command and imported from data source outside the application.
<code>BSA_CONFIG_DIR</code>	<code>\$TMP</code>	The directory containing configuration files used for unpacking of data files.
<code>BSA_LOG_HOME</code>	<code>\$TMP</code>	The directory containing the log files generated by the RPAS BSA logging functionality (for example, <code>_call</code>).
<code>BSA_LOG_LEVEL</code>	<code>INFORMATION</code>	The desired level of message logging. Used by both logging to screen and to log files. Valid values are: <ul style="list-style-type: none"> ▪ <code>PROFILE</code> ▪ <code>DEBUG</code> ▪ <code>INFORMATION</code> ▪ <code>WARNING</code> ▪ <code>ERROR</code> ▪ <code>NONE</code>

Table 3–5 (Cont.) RPAS BSA Variables

RPAS BSA Variable	Default Value	Description
BSA_LOG_TYPE	1	The desired logging type: <ul style="list-style-type: none"> ▪ 1=Text Only. ▪ 2=XML Only ▪ 3=Text & XML
BSA_MAX_PARALLEL	4	The maximum number of processes that can be started in parallel, from any spawning process.
BSA_SCREEN_LEVEL	NONE	The desired level of logging to the terminal. Valid values are: <ul style="list-style-type: none"> ▪ PROFILE ▪ DEBUG ▪ INFORMATION ▪ WARNING ▪ ERROR ▪ NONE
BSA_TEMP_DIR	\$TMP	Directory used to store temporary files, for example: for sorting temporary space, for one-off files created during batch processes.